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Wire Lamp Shade Frames
and
How To Make Them

A·W·Dragoo

Silk Covered Shades.

WIRE LAMP SHADE FRAMES

and

HOW TO MAKE THEM

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PREFACE

The difficulty encountered by the average manual training student in making a wooden lamp shade, and the expense of buying suitable shades of any sort has led to a thorough study of the problem. After experimenting with many different materials the wire frame covered with silk has met with the greatest success. The frames are not difficult to make, and the boys enjoy a change from the usual work with wood.

Little has been written on wire frame design and construction, and it is hoped that this book may open up the possibilities of this form of design and give to shop teachers and others interested in the work, something practical and usable.

Appreciation is here expressed to Chittenden and Eastman of Burlington, Iowa, for some of the designs and to Miss Lora M. Dexheimer and A. C. Newell of the Illinois State Normal University, for helpful suggestions in preparing the manuscript.

A. W. DRAGOO.

Illinois State Normal University,
Normal, Illinois, February 2, 1922.

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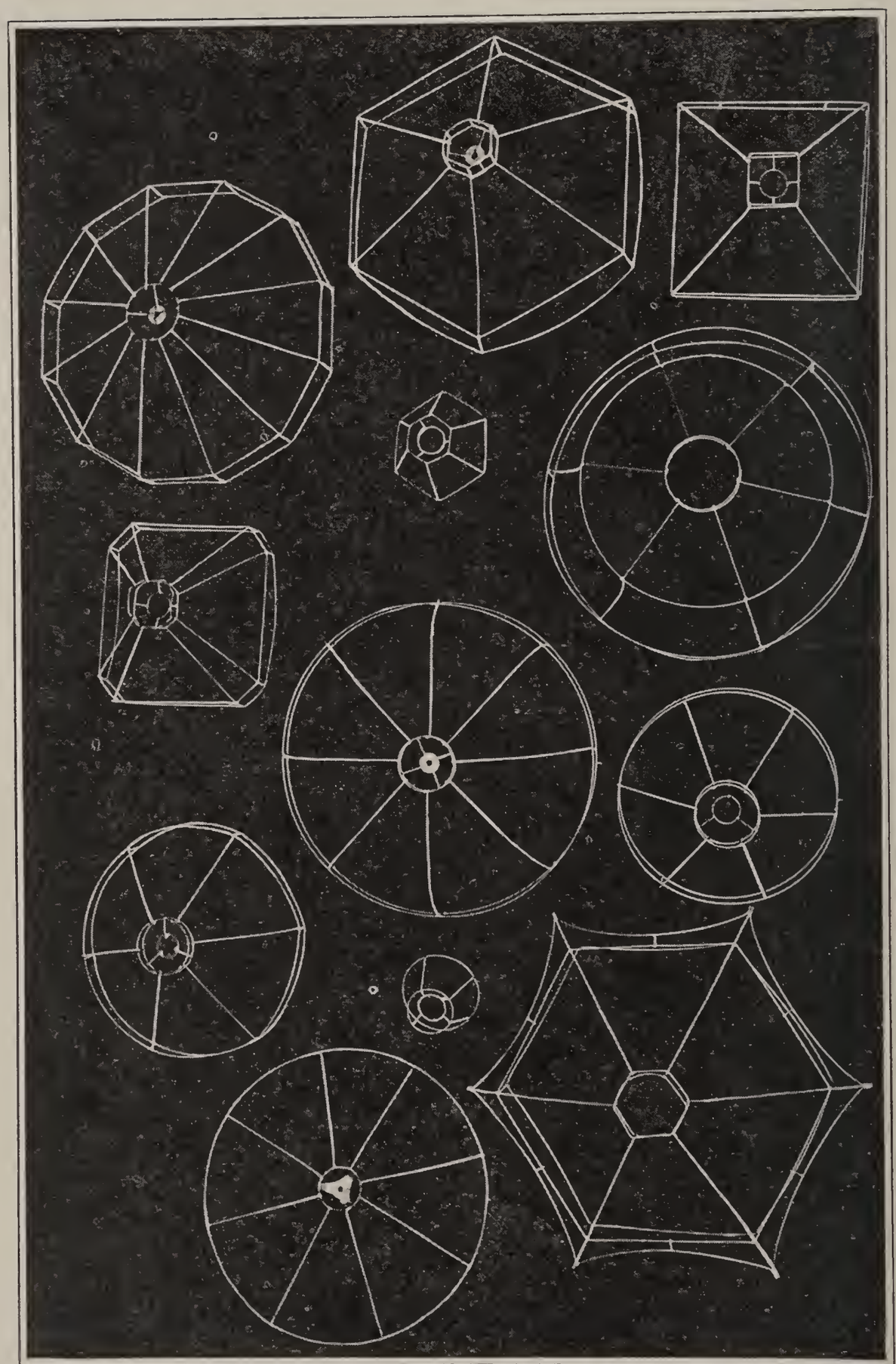


Illustration 1

INTRODUCTION

Few problems in the manual training shop possess greater interest to boys than the making of an electric lamp. The problem affords many tool processes besides giving opportunity for work in many kinds of material. The chief difficulty which always confronts the student is in securing or making a suitable shade. Shades may be purchased, but they are so expensive that they are frequently beyond the reach of all but a few boys. Paper and cardboard shades lack durability, and the wooden shade is too difficult for the average grade school boy to undertake.

The wire shade, made of materials so easily worked, seems to be the best solution of the problem. All processes necessary for complete success are easily mastered by the seventh or eighth grade boy, and the entire lamp problem thus affords satisfying interest to all who undertake it.

In regard to the question of covering for these wire shade frames, the author has found that this presents little difficulty. Most mothers, or sisters, in the home will be found capable of doing a satisfactory piece of work. If this can not be done in the home, some relative or neighbor can usually be found who will undertake the work. The sewing department might be interested in putting on the coverings.

Any problem which will link up the home, the school, and the boy, is a highly profitable and desirable one. Few problems possess this element as does the completed electric lamp. Since it is used in the home it is found practical, and parents take pride in pointing out the fact that it was made by their boy in the manual training shop. Every boy feels a just pride in worthy handwork and if given the opportunity and proper guidance will produce nothing else.

The following plates will make clear how these frames may be made in any shop. A dozen common shapes are given with complete directions for their construction. The plates are graded, beginning with the most simple forms and becoming progressively more difficult.

These frames will be found suitable for either table or floor lamps. After making a few of the simpler frames, the student will be able to alter the size of any of the frames to suit his particular needs.

It is always desirable to hang or support these shades on a cluster stem where possible. The expense of the cluster stem is considerable and to simplify this matter the shades for small lamps are provided with a ring support. This ring rests directly on the top of the bulb, and supports the shade. Shades have been made after each of these patterns, and found to hang satisfactorily.

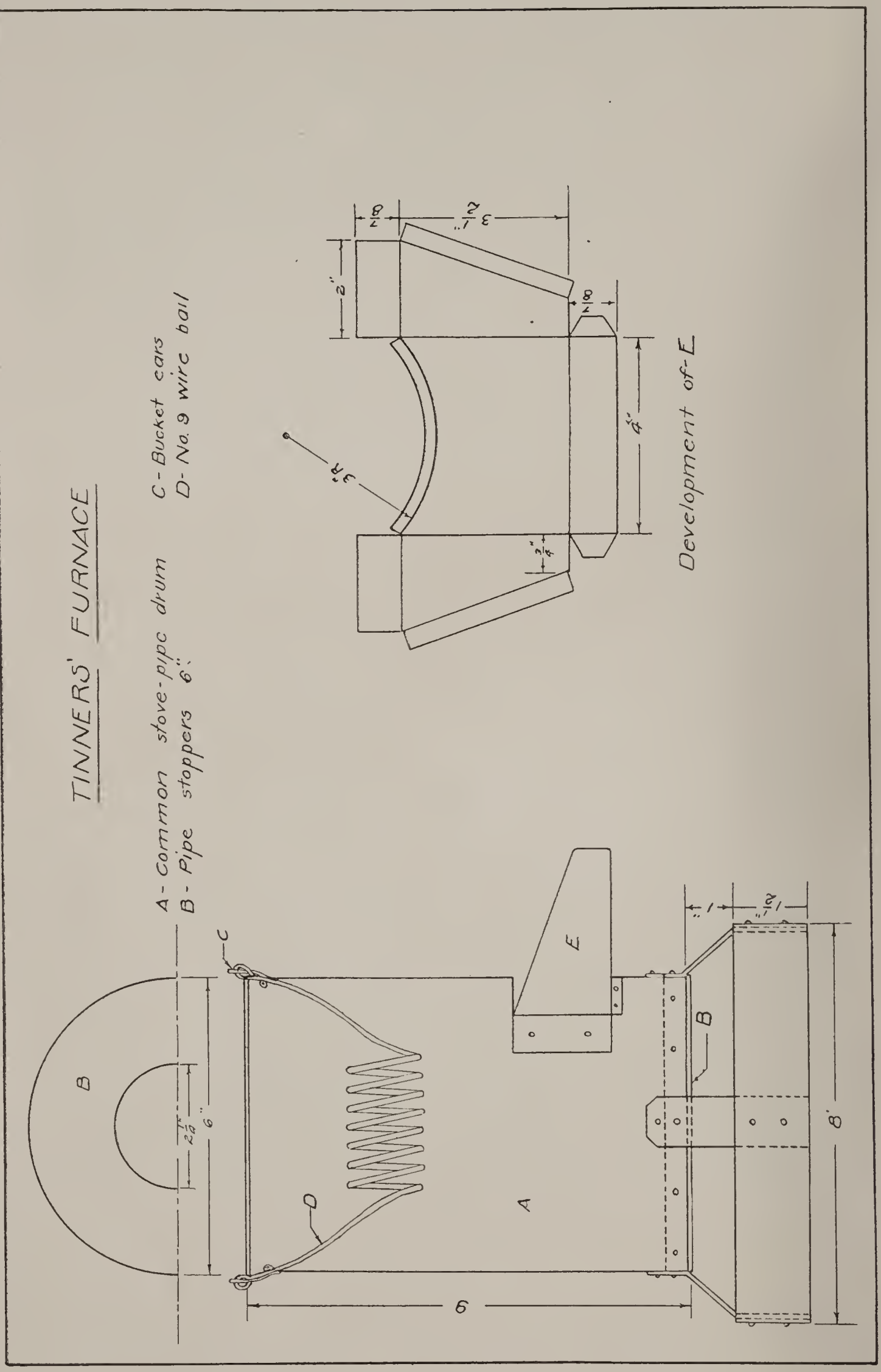


Illustration 2

EQUIPMENT

The equipment necessary for making wire shade frames is very simple and easily secured. Most shops are supplied with the necessary tools unless it be the soldering coppers, and these may be purchased for a few cents.

In order that the wire be handled with ease and the work be accomplished successfully, the following equipment should be at hand:

1 pair Round nose pliers, 5″.
1 pair Wire cutting pliers, 6″ or 7″ (Kleins).
1 pair Automobile pliers, adjustable.
1 pair Tinners' snips, 10″ or 12″.
1 Hammer, light weight.
1 Flat file, 8″.
1 Thin taper file, 6″.
½ dozen sheets emery cloth or fine sandpaper (00).
1 Small Bench vise, 3″ jaws.
1 pair Soldering coppers, No. 1½ (¾ lb. each).
1 Gas or charcoal furnace.
1 pair Dividers, 8″.

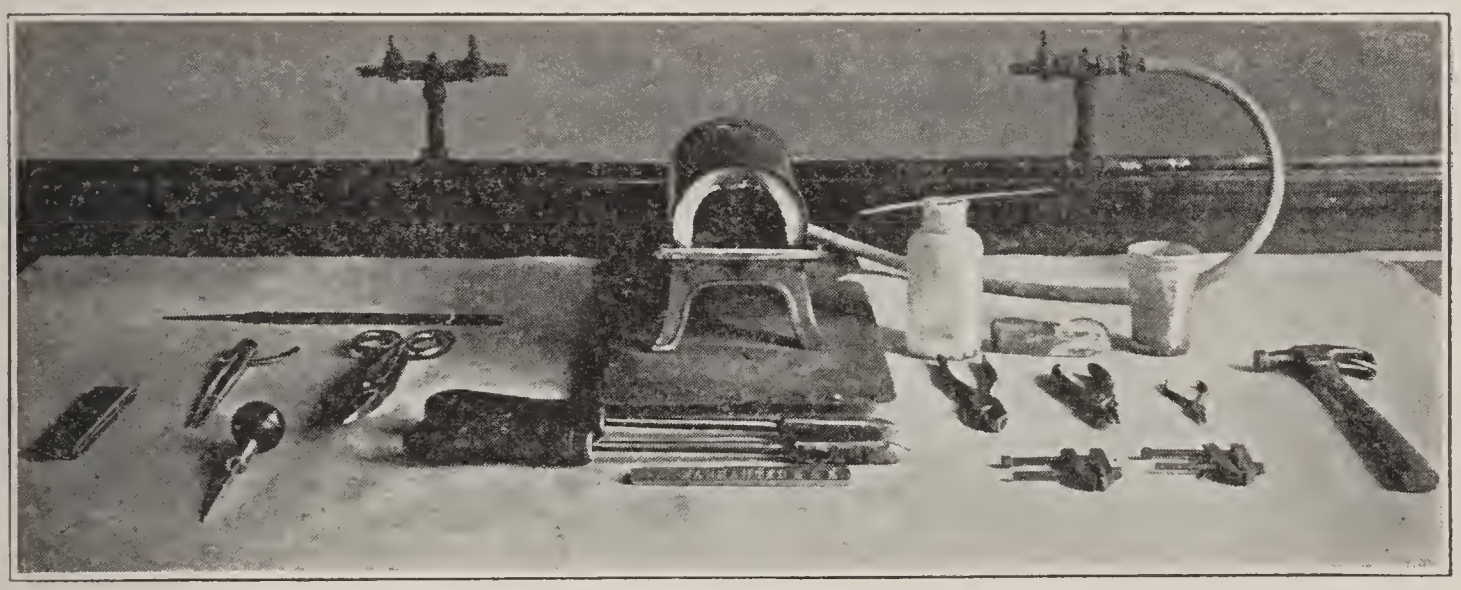


Illustration 3

The charcoal tinners' furnace will perhaps be most easily secured by most schools. The boys will enjoy making one as shown in Illus. 2. Electric soldering irons may be used, but they are expensive and if left connected too long will burn out. A gasoline blow-torch may also be used, if convenient, but owing to the danger of accident in filling, this is not recommended for young boys. The small gas furnace for manufactured gas is the most satisfactory if gas is to be had. Gas gives a good hot flame, and insures the clean copper, so necessary in this work.

The wire-cutting pliers should be of good quality. The Kleins' pattern, side-cutting pliers have been found very satisfactory. A pair of combination or adjustable pliers will be found very helpful in making sleeves and tips for splicing.

A word of explanation should be given here in regard to soldering coppers. Soldering coppers are sold by the pair. A No. 2 copper weighs one pound. The number signifies the weight of a pair. The copper used for this work is No. 1½; hence one copper weighs ¾-pound.

MATERIALS

Wire best suited for this work is bright tinned wire. This wire is usually difficult to procure except in large lots. The common galvanized wire is more easily secured and answers the purpose just as well if cleaned with sandpaper. In cleaning the wire it is best to cut off a length sufficient to make the shade, and sand the entire piece before cutting into short lengths. Hold one end of the wire in the vise and brighten the entire piece with fine sandpaper. The solder will be found to flow easily on the brightened wire.

Some pieces of thin tin are necessary for making the sleeves and end clips. Tin from a bright can is satisfactory.

A small quantity of fine wire, such as comes on spools, should be provided to bind parts where necessary. Besides this fine wire several feet of ordinary broom wire is required for making the hangers. Wire from an old broom may easily be secured.

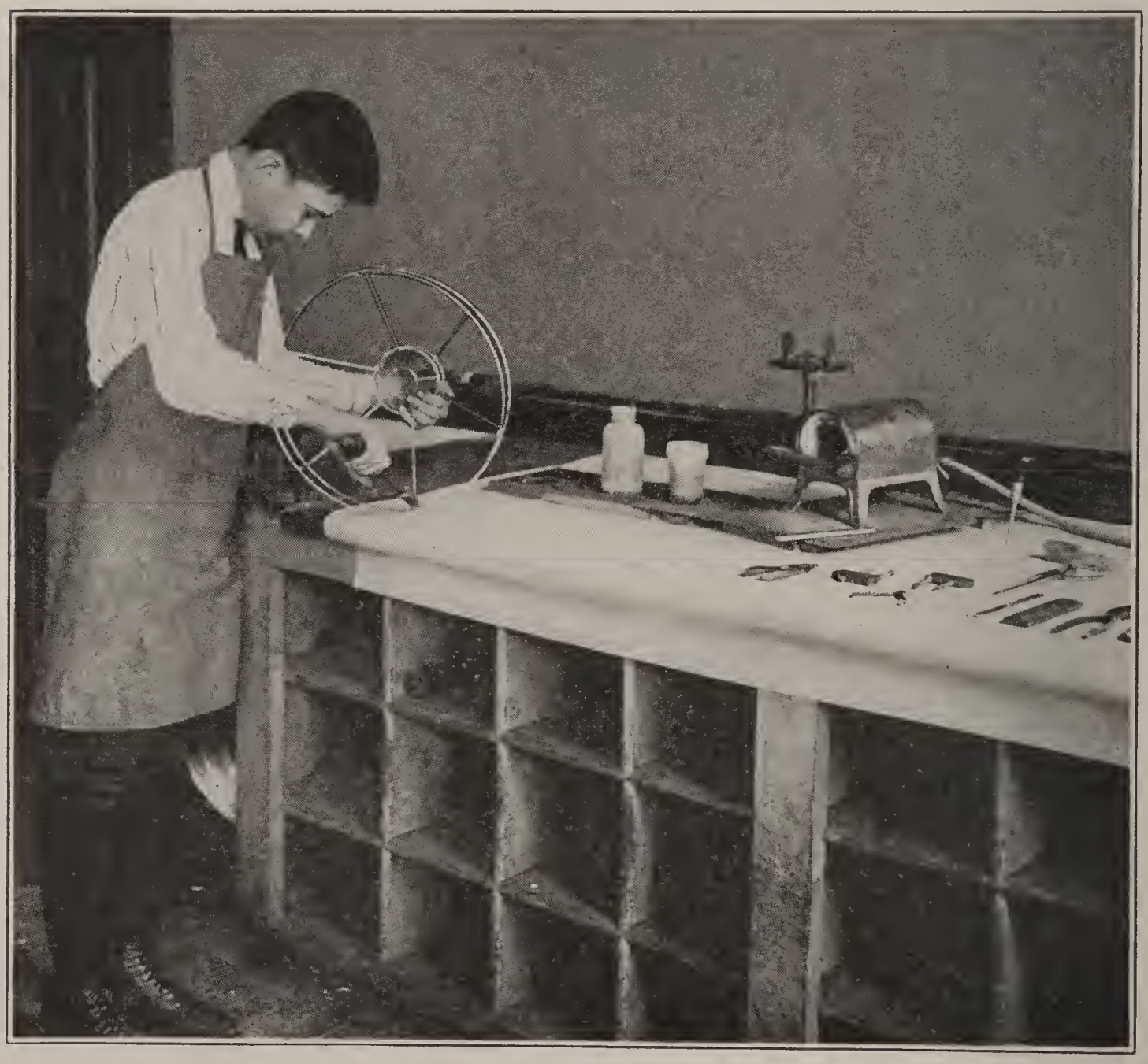


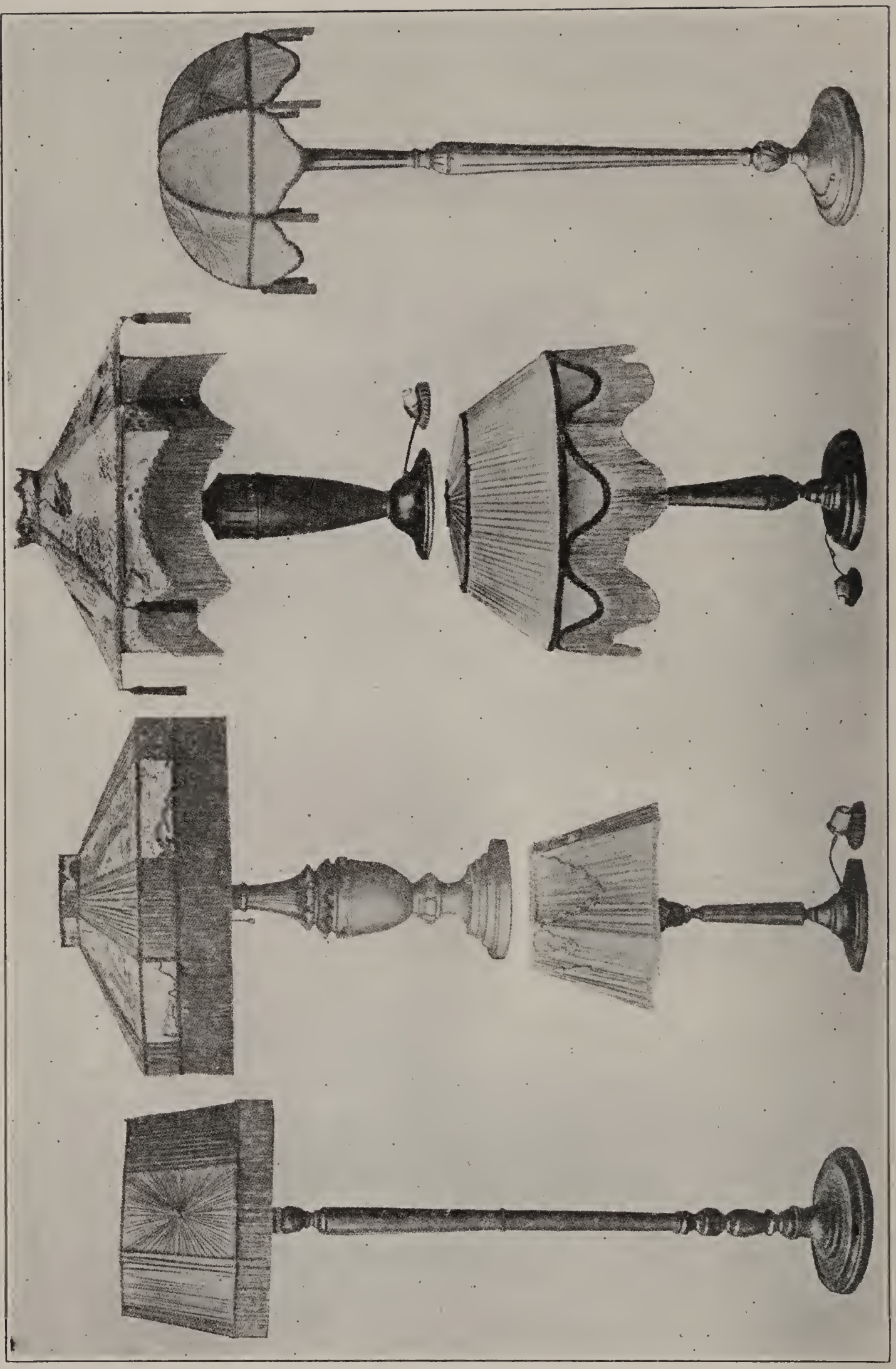
Illustration 4

The common tinners' solder, known as half-and-half, will be found best for this purpose. Much of the ordinary wire solder is too soft and should not be used.

A lump of sal ammoniac and a few cents' worth of powdered sal ammoniac are necessary in tinning the copper and keeping it clean.

There are many brands of soldering salts and pastes which will be found very satisfactory. Hydrochloric acid and zinc is easily provided and may be made as directed hereafter.

Illustration 5



Typical Applications of Silk Covered Shades

PART I

PROCESSES AND METHODS

General Directions for Soldering

Soldering is the process of joining two pieces of metal by means of another metal of lower melting point. Solder is the common metal used for this purpose and is an alloy of tin and lead. The soldering copper is used to apply the heat which causes the metals to be brought to the fusing point.

In soldering, the surfaces to be united must be made perfectly clean and free from oxide. This is commonly done by scraping, sanding, or filing these surfaces; and in order that the formation of any oxide may be prevented during the process, acid, borax, sal ammoniac or resin is used. The common acid used by most tinners is made in the following manner:

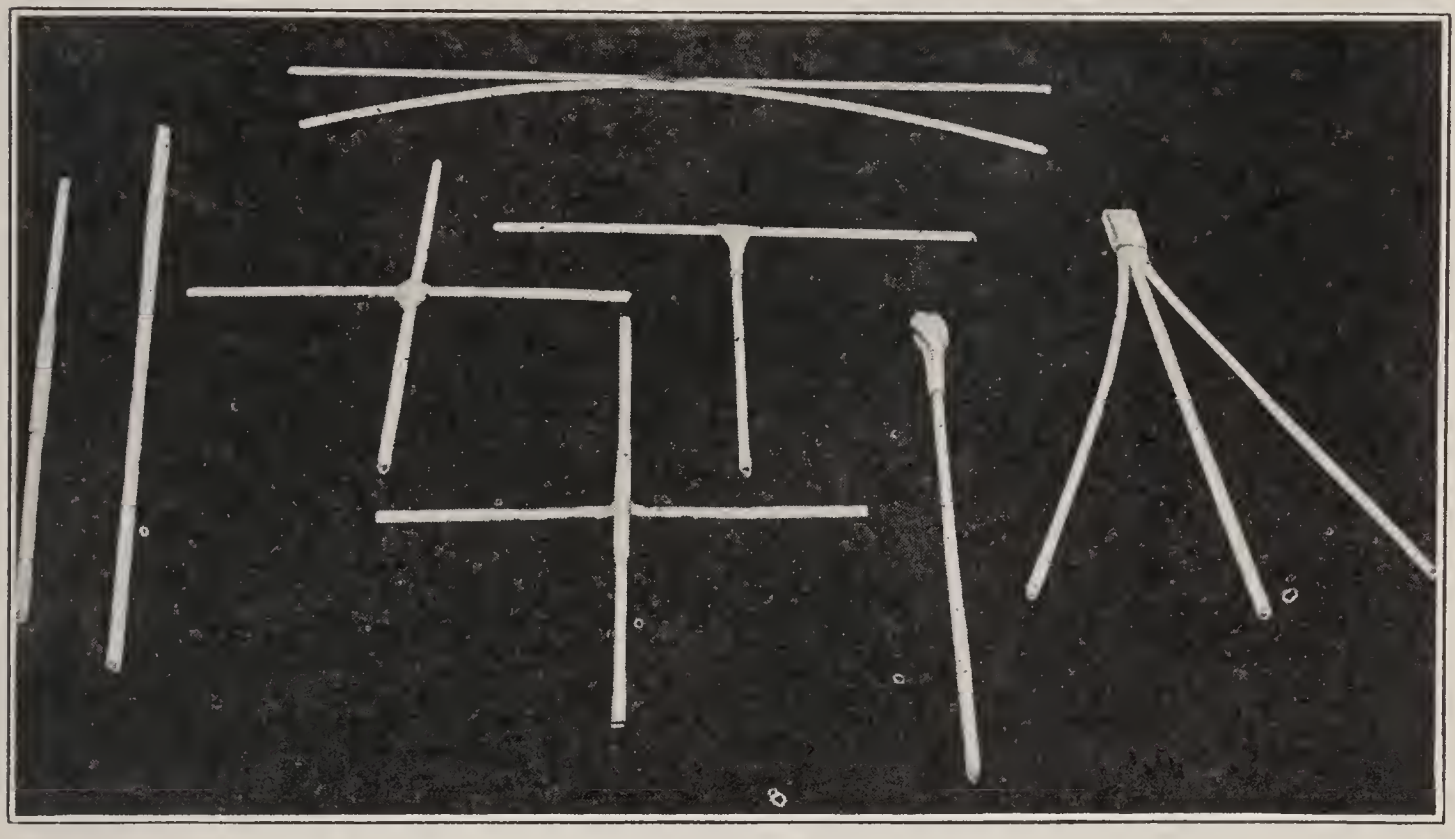


Illustration 6

To a quantity of hydrochloric acid add as much zinc as the acid will take. When pieces of zinc are dropped into the acid, bubbles will be seen to rise. Zinc should be added until no more bubbles are seen. Care should be taken to keep the acid clean and it is best to keep it sealed when not in use. A little care all around in this matter of cleanliness will help solve many of the problems of soldering.

Besides having clean acid and clean parts, the soldering copper must be kept clean and well tinned. A carbon deposit will collect on the copper from the gas or charcoal heat. This must be removed. At the beginning, tin the copper in the following manner:

Secure a lump of sal ammoniac. Heat the copper hot enough to melt the solder. Rub the copper over the lump of sal ammoniac until the entire point shows a bright copper color. Melt a few drops of solder and rub this over the sal ammoniac with the hot copper. The solder should spread out over the copper and leave the point a bright silver color. If the copper is now touched to the solder, small globules of the metal should cling to the point ready to be applied to the pieces of metal.

After the copper is properly tinned, it will remain so if not allowed to get too hot. Soldering coppers should never be allowed to become red hot. If this happens the copper is useless until retinned.

In order that the copper may be kept in a perfectly clean and bright condition, it is necessary to have a dipping solution. This may be made by dissolving a few ounces of powdered sal ammoniac in a quart of water. When the copper is taken from the heat, the point should be dipped quickly into this solution. This will insure a bright clean copper at all times.

It is frequently necessary to tin parts of metal or wire before soldering. This may be done by using the acid flux on the points to be tinned and running a little solder on the parts before bringing them together. If this is done when wires are to be joined, the joint will be much stronger and much more easily made.

It must be remembered that the strength of a soldered joint depends upon the metals fusing together into one homogeneous mass. This can not be accomplished unless both metals are brought to the fusing point. It is necessary, therefore, to apply the heat long enough to bring the parts to the fusing point of the metals.

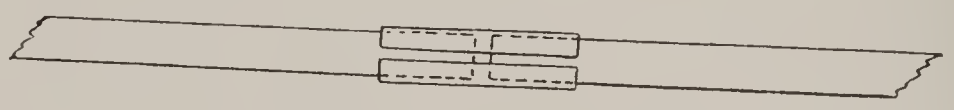


Fig. 1

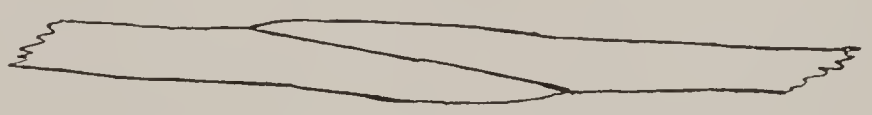


Fig. 2

There is no reason why any boy cannot be entirely successful with his soldering if he is taught absolute cleanliness from the start. Too much emphasis on this point is not possible, and a little experience will soon teach that few failures result from any other cause.

Joining Wires End to End

There are two common methods of joining wires in this manner. The tin sleeve may be used as shown in Fig. 1, or the wires may be filed and made to overlap as shown in Fig. 2. The tin sleeve is to be preferred and should be applied in the following manner.

The tin sleeve should be made by cutting a piece of tin somewhat narrower than the circumference of the wire. The sleeve, when bent around the joined ends of the wire, should lack just a little of meeting. This is to permit the solder to flow easily around the entire joint and secure greater strength. This sleeve should be about one inch long.

In making the overlap joint, shown in Fig. 2, the wires should be filed for about 2 inches each. The solder is applied directly to the joint.

Joining Cross-Wires at Right Angles

Fig. 3 shows a method of joining cross-wires by the use of fine wire to strengthen the joint. In this case the wires are simply crossed and a few turns of fine wire are used to hold them in place. The solder is applied over the entire lap. Care must be taken not to get too much wire wound around the joint or it will make the joint look too big when covered with solder.

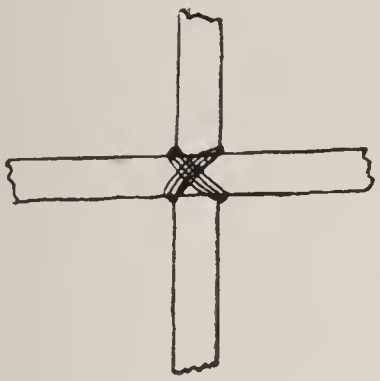


Fig. 3

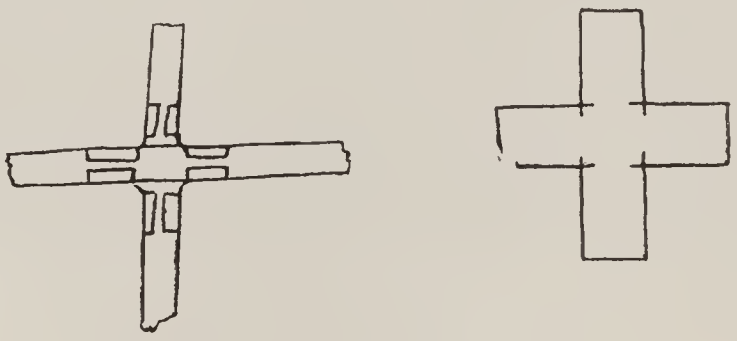


Fig. 4

Another method of joining cross wires is shown in Fig. 4. This is known as a cross-clip and is made as shown. The wires may be flattened slightly at the point of contact. Proper soldering will insure a strong joint where the cross-clip sleeve is used.

The wires may also be joined directly with the solder.

Joining End-Wires to Cross-Wires

Fig. 5 shows clearly the method of fastening end-wires to cross-wires. The use of this end sleeve insures a smooth strong joint. The end sleeve

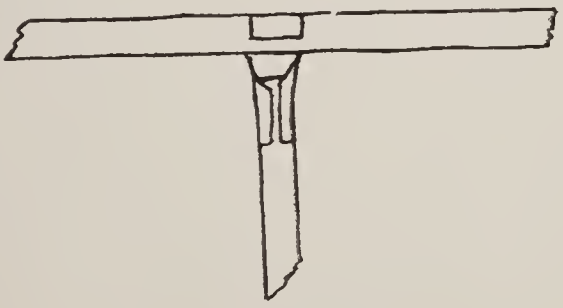


Fig. 5

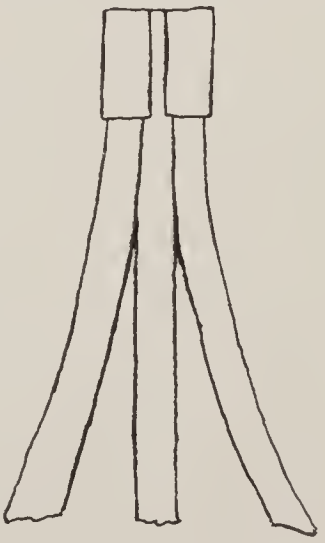


Fig. 6

is easily made by using the pliers and bending the tin over the wire as shown.

Joining the Ends of More Than Two Wires

It is often desirable to join more than two wires together at the same place. Fig. 6 represents a method of doing this by using a small tin clip. If the points of contact are flattened slightly with a file, the clip is more easily applied and rolling of the wires, one upon the other is prevented.

Joining Curved or Arched Wires

Curved or arched wires are best joined by using a tin clip soldered in place as shown in Fig. 7.

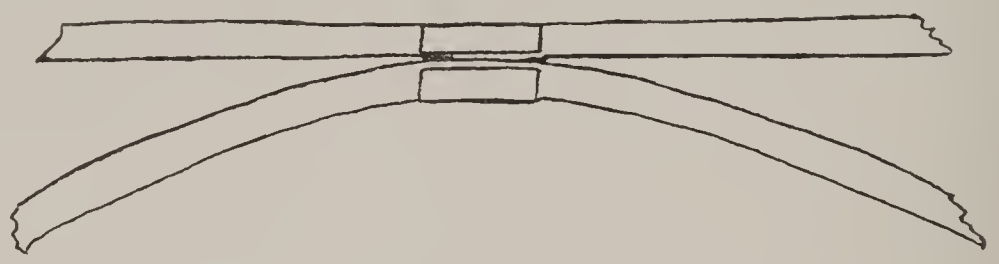


Fig. 7

Shaping the Wire

In making a true ring of wire or in shaping long curves, it is essential that the bends be as smooth as possible. Short kinks must be avoided. A round block of hard wood, three or four inches in diameter, is a great aid in shaping different forms. The wire as it comes from the roll will not be straight but may be made so by pounding slightly on a flat surface. Care should be taken not to mar the wire with a hammer. Light blows will do no injury.

Methods of shaping special forms will be mentioned in the design descriptions.

It is frequently necessary to bend the wire at a sharp angle. Place the wire in the vise and bend by tapping lightly with a hammer or use the pliers and grip tightly while making the bend. A rather short smooth bend will be found best in most cases. This is especially true when radiating ribs are to be joined at the angle.

Making the Tin Sleeves and Clips

In making the tin sleeves and clips difficulty is sometimes encountered in bending the tin around the wire. This difficulty may be overcome in the following manner:

Place in the vise a piece of wire of the size for which the sleeve or clip is intended. Let the wire project about one inch beyond the jaws. Cut a blank piece of tin somewhat narrower than the circumference of the wire, and as long as is required. Place the tin in the jaws of the pliers, having the tin at right angles to the face of the jaws. Force the tin against the projecting wire in the vise and close the pliers. The sleeve will shape itself easily. To prevent spiral results see that the wire rests in the center of the tin before closing the pliers. Observe Illus. 7.

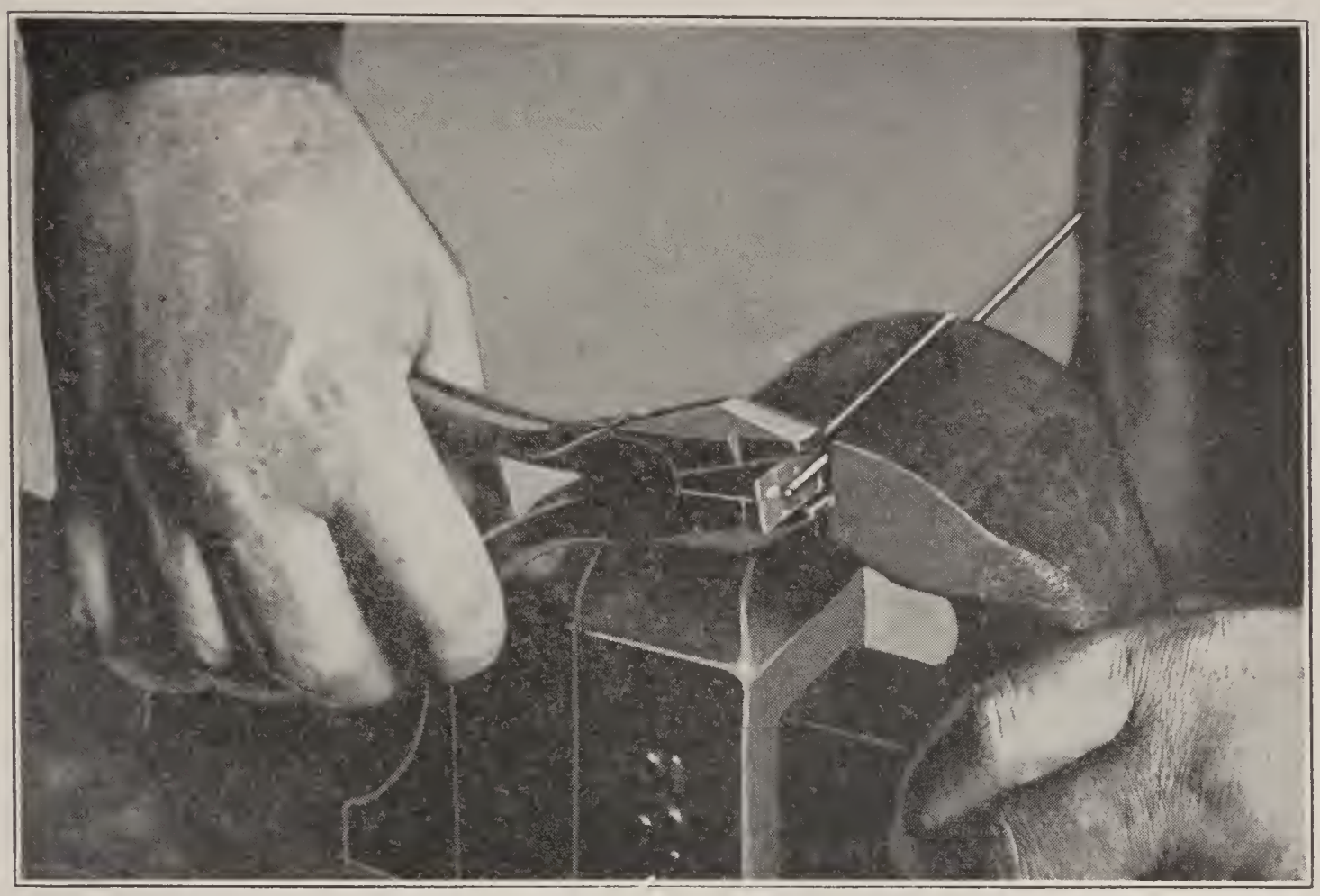


Illustration 7

Hangers or Supports

Small shades are supported on a small ring which rests directly on the light bulb. In making these supports, it is not always necessary to use the tin clips. Instead, the wire may be bent around the top ring or rim of the shade, and soldered in place. The small ribs may also be bent around the supporting ring and soldered in place. Large wire should never be bent and fastened in this manner.

Large shades require different methods of support. Hanging a large shade on a single bulb should not be attempted. The cluster stem, Fig. 9, is a necessity here, and all of the designs shown for large lamps are provided with a heavy tin or other metal support. The method of making these supports is made plain by the drawings and descriptions accompanying each design.

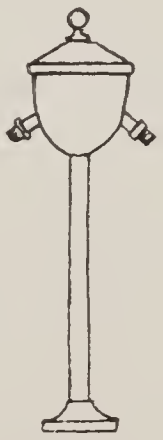
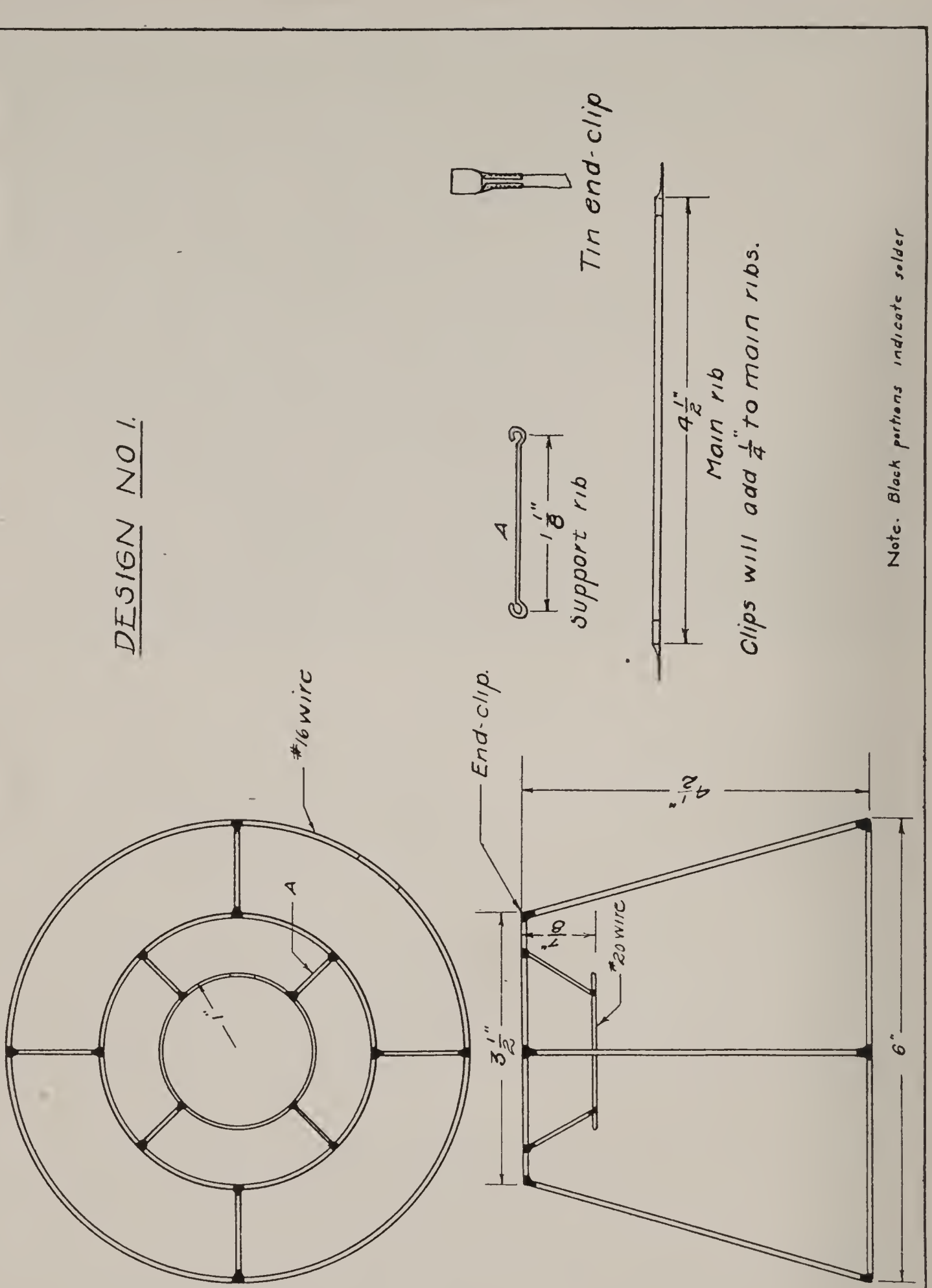


Fig. 9

DESIGN NO 1.


#16 wire
A
1"
End-clip.
A
1 1/8"
Support rib
Tin end-clip
4 1/2"
Main rib
Clips will add 1/4" to main ribs.
Note. Black portions indicate solder
4 1/2"
3 1/2"
1/8"
#20 wire
6"

PART II

DESIGN No. 1

In making the small round shade shown on the opposite page it is best to begin by making the rings. Shape the rings over a piece of round wood and see that the ends of the wire meet nicely. Join by using a sleeve.

Next, prepare the four ribs. See that all are cut exactly the same length. Make eight end clips, and fit them on the ribs. Have all of the clips, and sleeves ready and in place before beginning to solder. Solder the clips to the ends of the wire ribs. Be careful to let the copper remain on the clip long enough to insure the solder's running around the wire under the tin. Run a little solder on the end of the wire. See that the clips are parallel and that both face the same way.

After soldering the rings, the ribs should be fastened to them by cutting the end-clips to the proper length and bending them over with the pliers. If a short piece of wire is used to bend these clips over before placing on the rings, the process of assembling will be found more easy. The clips should be bent around the rings sufficiently to hold the entire frame together before soldering. Care at this point is required to see that the frame is straight. Adjust the four ribs so that they will stand at equal distances apart. All clips should face in. Apply the solder from the inside. Use a fine file to dress all rough joints after soldering.

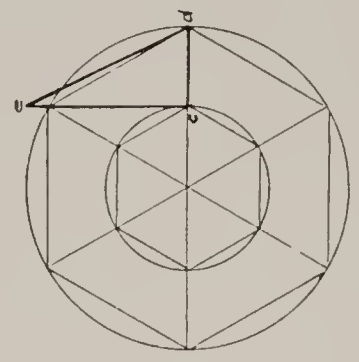
After the main frame is set up make the ribs and ring for the support. A small tin sleeve should be used on this supporting ring. The ribs may be bent around and soldered as shown.

Main frame, No. 14 wire.

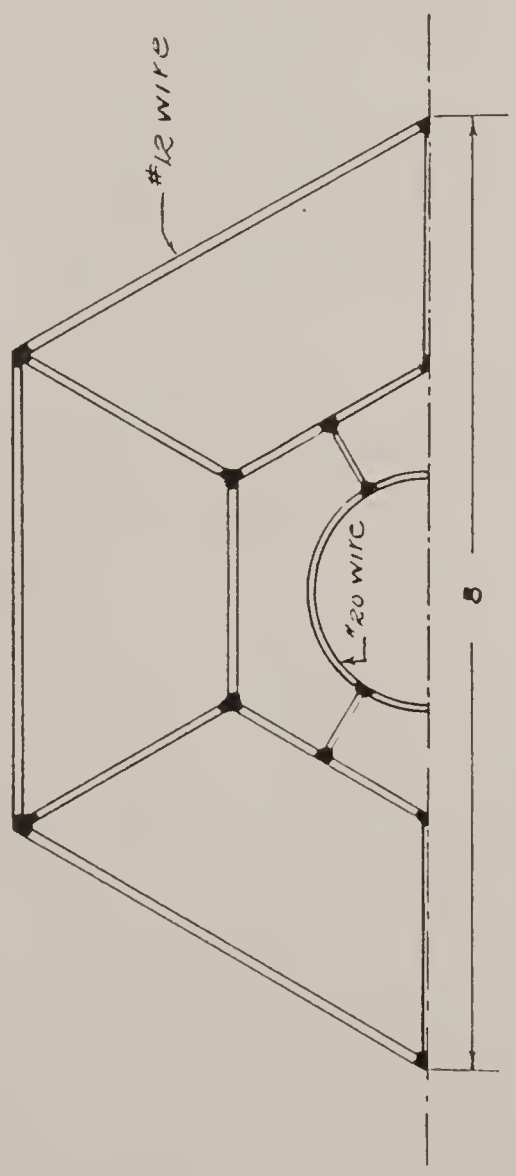
Broom wire support, No. 20 wire.

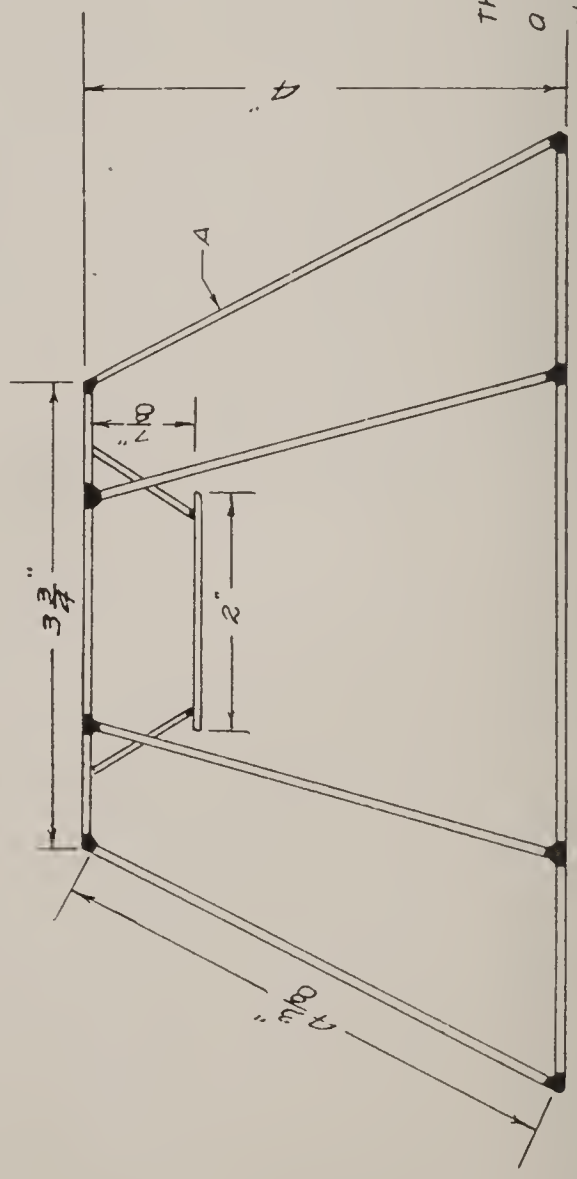
Shade suitable for small boudoir or desk lamp.

DESIGN NO 2



To find the true length of rib-A lay out the hexagons full size as shown At-c-erect a perpendicular equal to the height of the shade The line e-d will be the true length





DESIGN No. 2

This frame is made similar to No. 1, except in the method of fastening the parts. In design No. 1, we used the tin clips. In this one, we shall use the direct method of applying the solder without the use of the sleeves or clips except for the main ring.

In laying out the hexagons for the top and bottom rings, it is well to lay out the circles on a large board and draw in the hexagons by using the radius. Place nails at the angles, around which the wire may be bent.

Prepare the top and bottom rings and join with sleeves. Cut the ribs to the proper length and file the ends flat. Tin the ends of all ribs, also the angles where they are to be joined. (This is important.)

After tinning, place the end of the rib directly against the ring and apply the solder. The finished joint should be similar to Fig. 8.

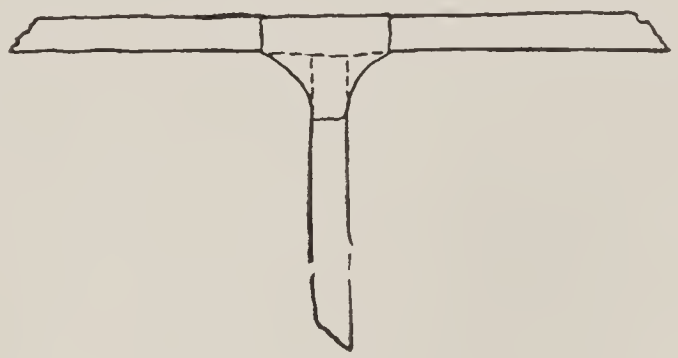


Fig. 8

This direct method of applying the solder without the use of wire or tin is very effective if care is taken in turning the parts. This process will be used in many places in making larger shades and should be mastered at the start.

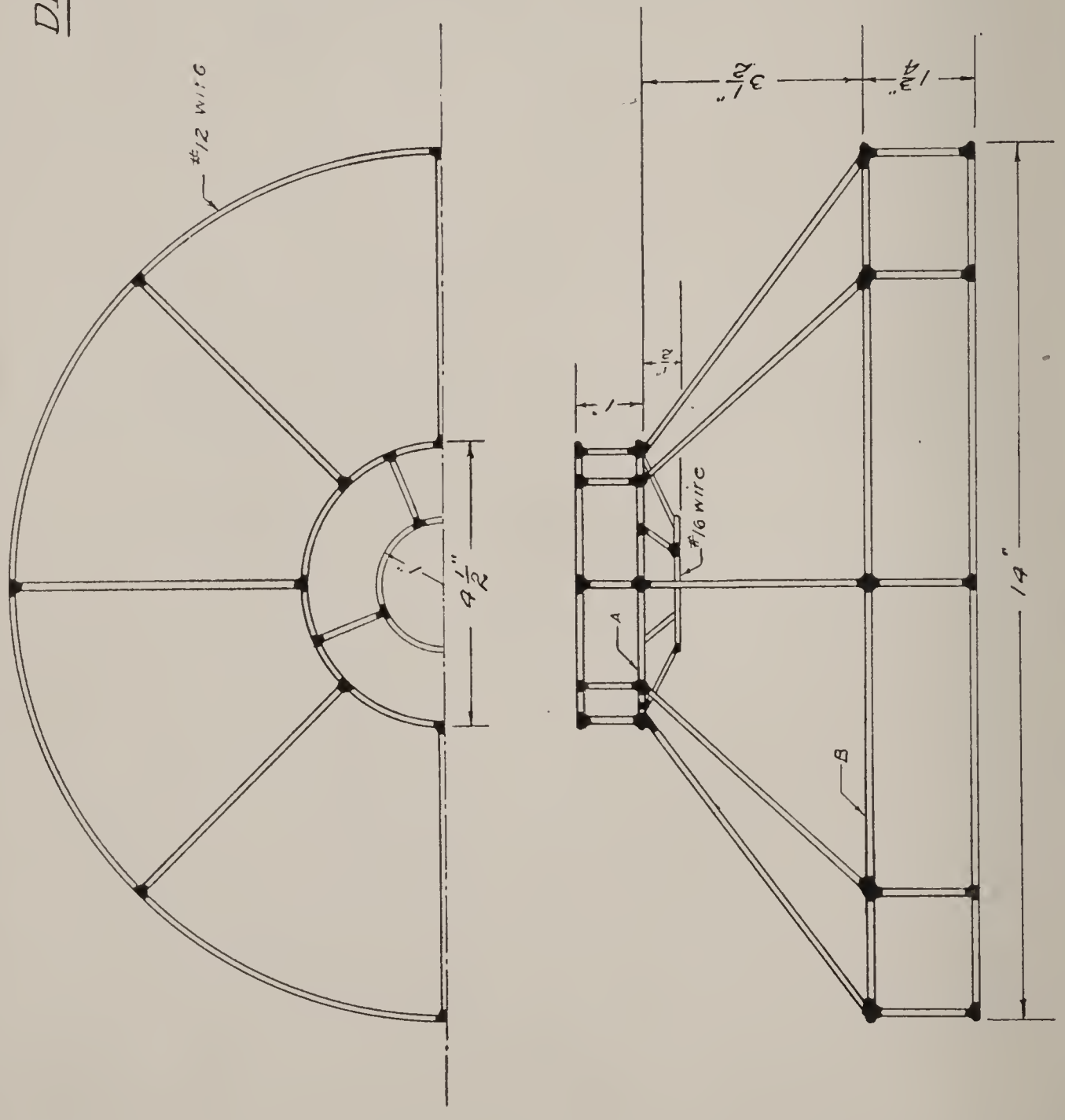
The method of supporting this shade is the same as No. 1.

Main frame, No. 14 wire.

Supporting ring and ribs, No. 20 wire.

Shade suitable for dressing-table lamp.

DESIGN NO 3.



DESIGN No. 3

This is a round shade somewhat larger than those in the preceding designs and is intended for use on table lamps.

Make up the four rings, joining each with a tin sleeve. Make careful measurements and cut and bend the ribs as shown.

All rings are to go outside of the rib and may be soldered with or without the use of fastenings. Rings A and B should be soldered in place first. The remaining rings are soldered directly to the ends of the main ribs.

This shade may be hung in the same manner as designs 1 and 2. If a cluster stem is to be used, a metal hanger or support should be provided. See design No. 6.

Main frame, wire No. 12.

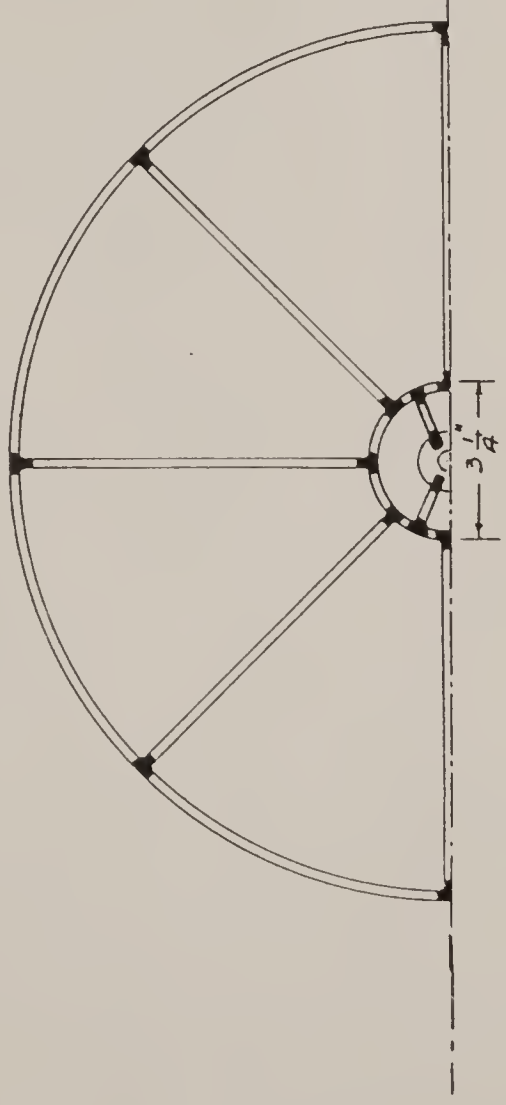
Support, wire No. 16.

Shade suitable for medium sized table-lamp.

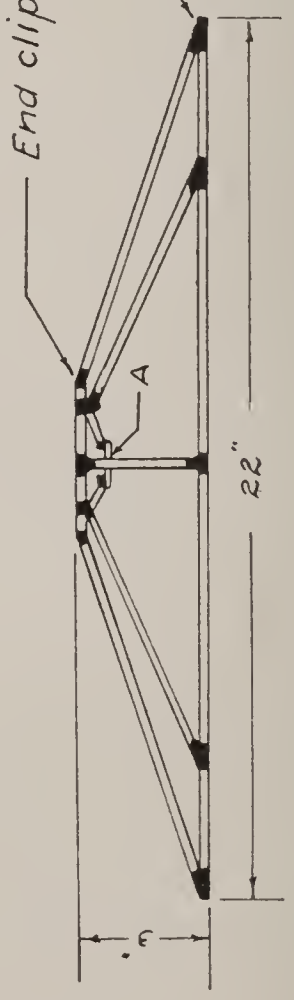
DESIGN NO 4

$\frac{7}{16}$ iron washer for support=A
Tin the washer and solder
the wires to it.

Hanger A should drop about $\frac{3}{4}$" below
the top ring.



All wire #12



DESIGN No. 4

The frame here shown is designed to be used with a throw shade or cover; that is, no material is fastened to the frame. The ease with which this frame is made and the simplicity of the covering makes it one of the most practicable for manual training shops. The method of construction is very simple. Make up the rings and ribs and join by using tin clips and sleeves.

The method of hanging this shade is different from that used in preceding designs. Large shades must be supported on the lamp base by means of a cluster stem. These stems may be had in a variety of forms but each has a bolt and nut at the top for holding the shade. Some provision, therefore, must be made in the frame for fastening it to the cluster stem. Such provision is made in this frame by providing the support as shown at A.

Suggested Covering

A suitable covering may be made for this shade in the following manner:

Procure one square yard of suitable material, such as silk. If the silk is thin a lining should be provided. Four yards of four-inch fringe for the edges and four tassels for the corners are all that is needed.

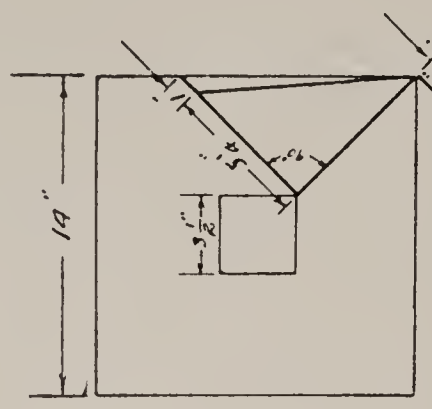
This material is made up into a square cover and is simply thrown over the frame. If suitable colors are chosen, very pleasing results may be obtained with this shade.

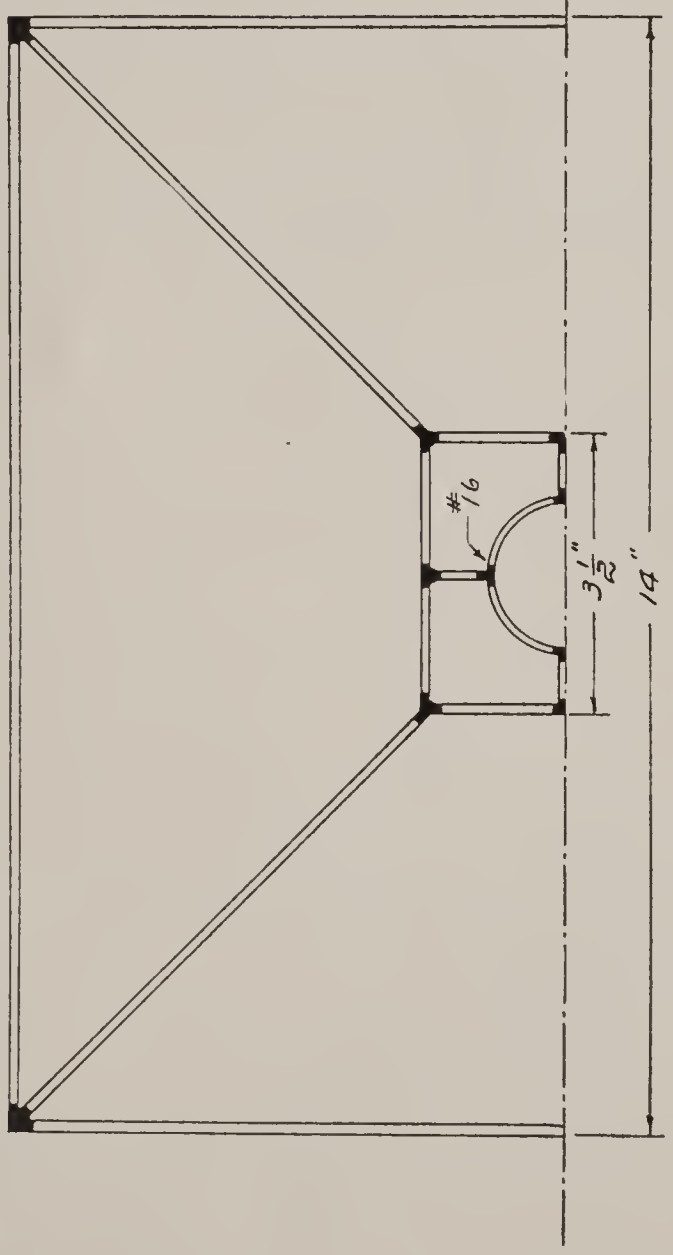
All wires No. 12.

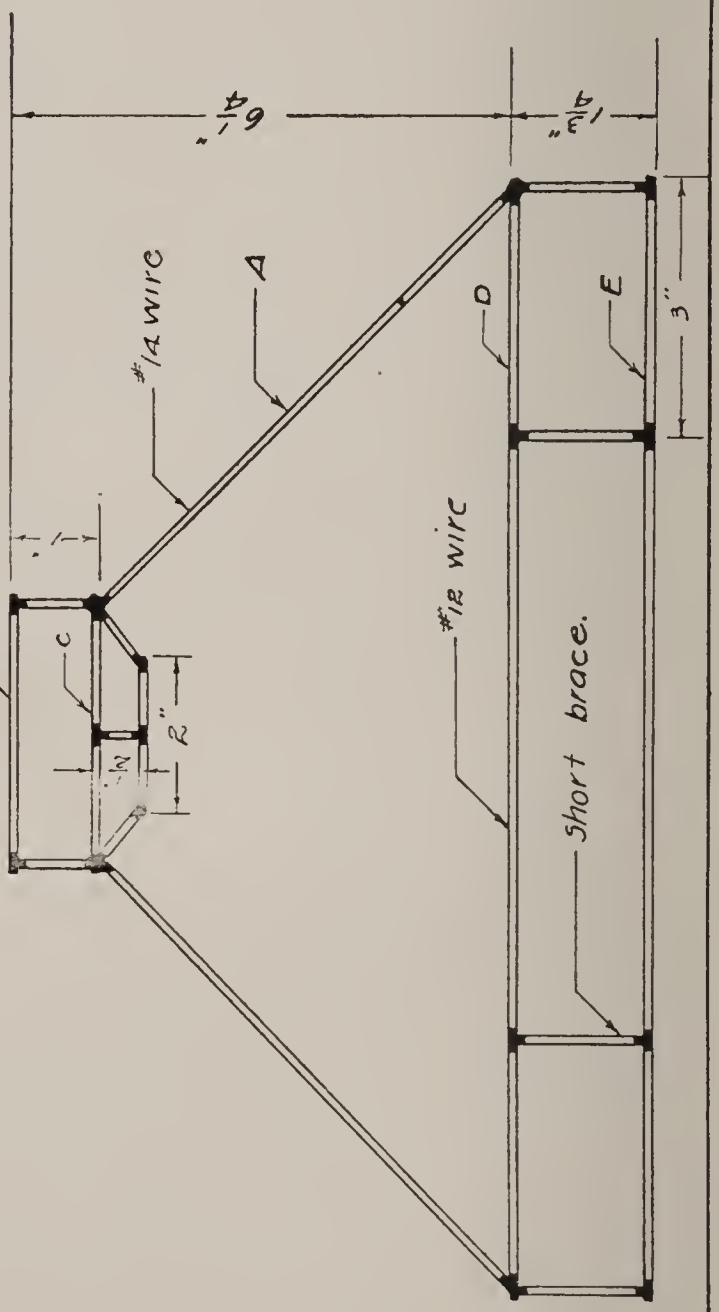
Shade suitable for piano or reading lamp.

DESIGN NO 5.

It cluster stem is to be used a metal support should be provided as in design A.







DESIGN No. 5

This frame is of rather simple construction and is suitable for table lamps without cluster stems. If the cluster stem is to be used, a metal support similar to that shown in design 4 should be provided.

Begin by making up the square frames B, C, D and E. To find the true length of the main ribs, lay out a square on the table top as shown. Solder all square frames on the outside. See that the solder runs well around the wire.

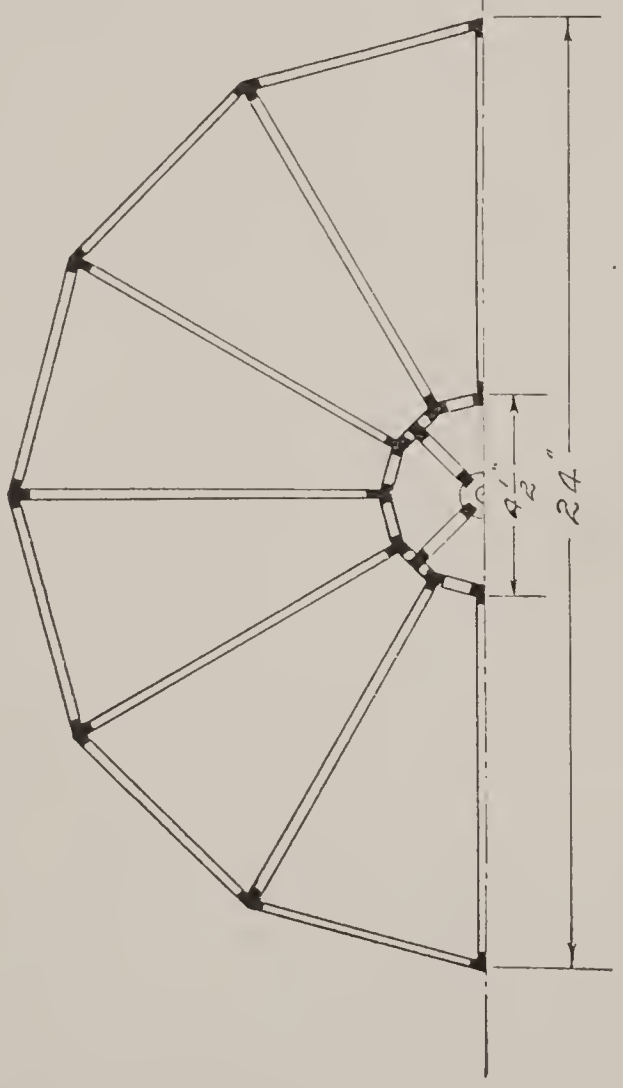
The supporting ring is made as in designs 1 and 2.

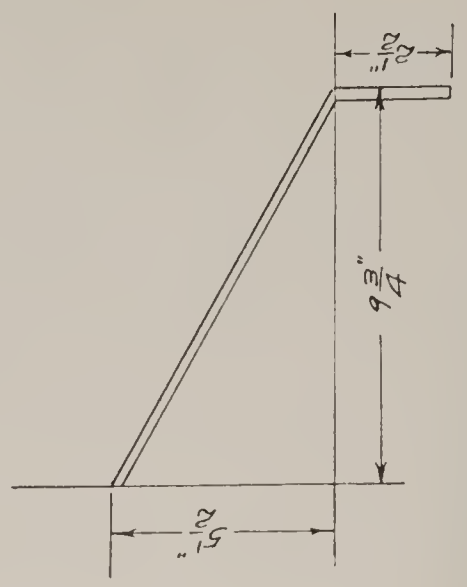
All wire No. 12.

This shade is suitable for a rather low table lamp. For tall stems the size should be increased to 16 or 18 inches.

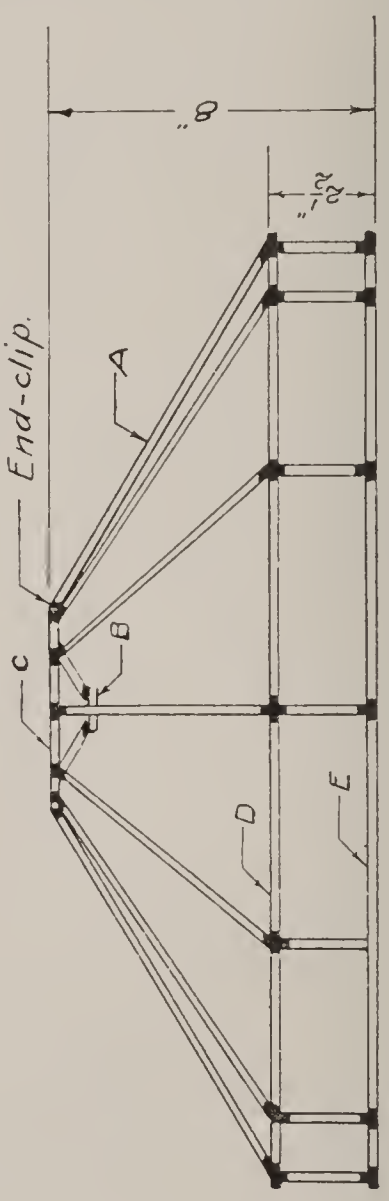
DESIGN NO-6

Support-B-should drop 1" below top ring.





Layout of rib-A



DESIGN No. 6

This is a twelve-sided or paneled shade for use on large floor lamps. Its size and weight demand great care in soldering all joints.

To lay out the twelve-sided rings, a large flat table top or board should be provided. Great care should be taken in laying out the forms to get the sides exactly the same length. Draw a large circle 24″ in diameter and by using a large 30°x60° triangle, lay off the twelve sides. Drive nails at all angles and carefully bend the wire to the proper form. Always use the pliers in bending the wire. Do not try to bend the wire by forcing it around the nail.

Lay out the top ring C on the same board. By drawing radii from the nails the faces of the upper ring are easily found. Join all rings with a tin sleeve. Prepare the ribs as shown and solder by use of end clips, to the top ring first. The angle at which these ribs should stand with reference to the top ring is easily observed by noting that the bend at the bottom of the rib should be at right angles to the plane of the ring.

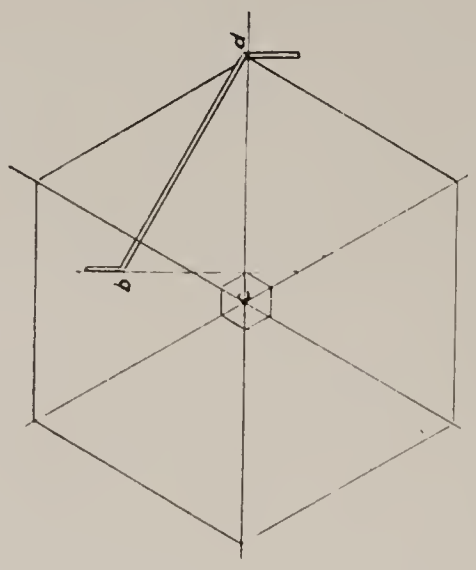
Solder ring D in place, all ribs to be placed on the inside. Ring E is soldered directly to the bottom ends of the ribs. End-clips may be used if desired.

The support for this frame is made by soldering the supporting ribs to a common 7/16″ iron washer as shown at A, design No. 4. File the iron washer bright and tin with a little solder before attempting to solder the ribs to it. The ends of the supporting ribs may be soldered directly to the top ring C.

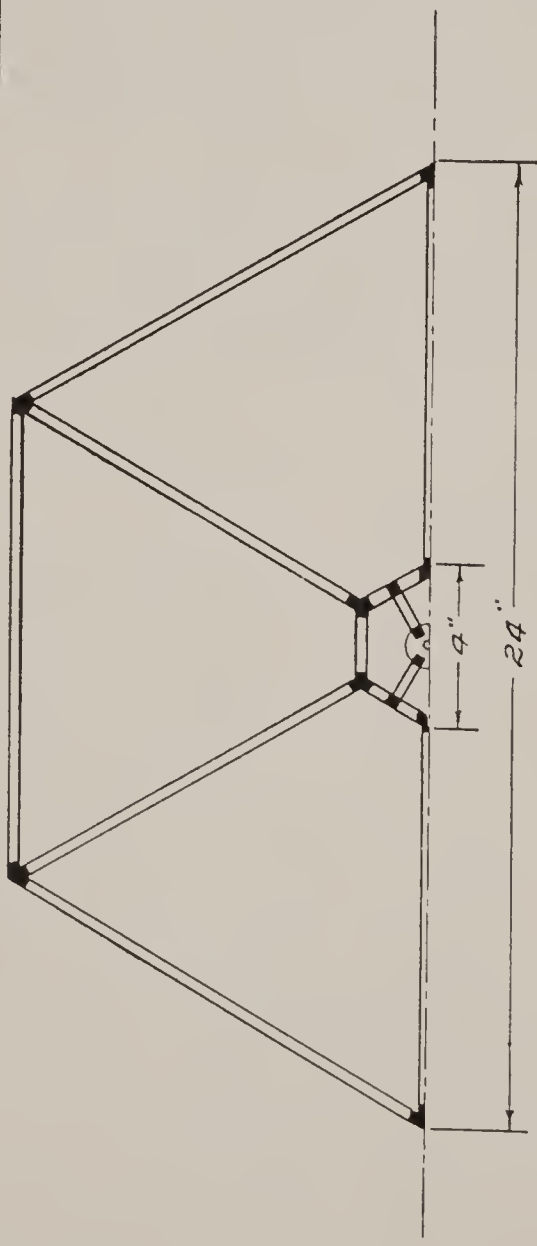
All wire size No. 12.

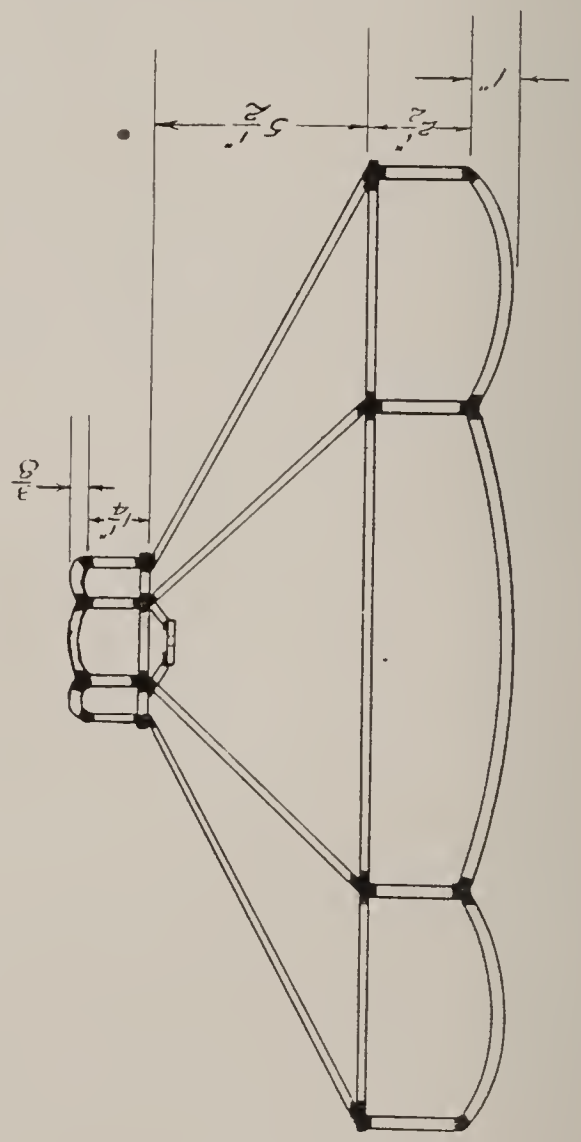
Shade suitable for piano or reading lamp.

DESIGN NO-7



Lay out full size. c-d = 10" b-c = $5\frac{1}{2}$"





DESIGN No. 7

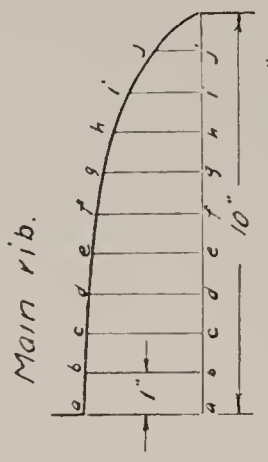
In this design we have a 24″ hexagonal shade suitable for a small floor lamp. Lay out the hexagonal main frame rings in the regular manner, and cut and bend all ribs to proper length and shape.

Put on the curved wire at the bottom by soldering a long straight piece of wire directly to the bottom end of a rib. Give the wire the proper curve and solder it to the next rib. Continue until all ribs are soldered. Do not attempt to shape these curved wires and solder to the frame afterwards. The method described here will be found much easier. The curved wire around the top is shaped and fastened in the same manner as the bottom.

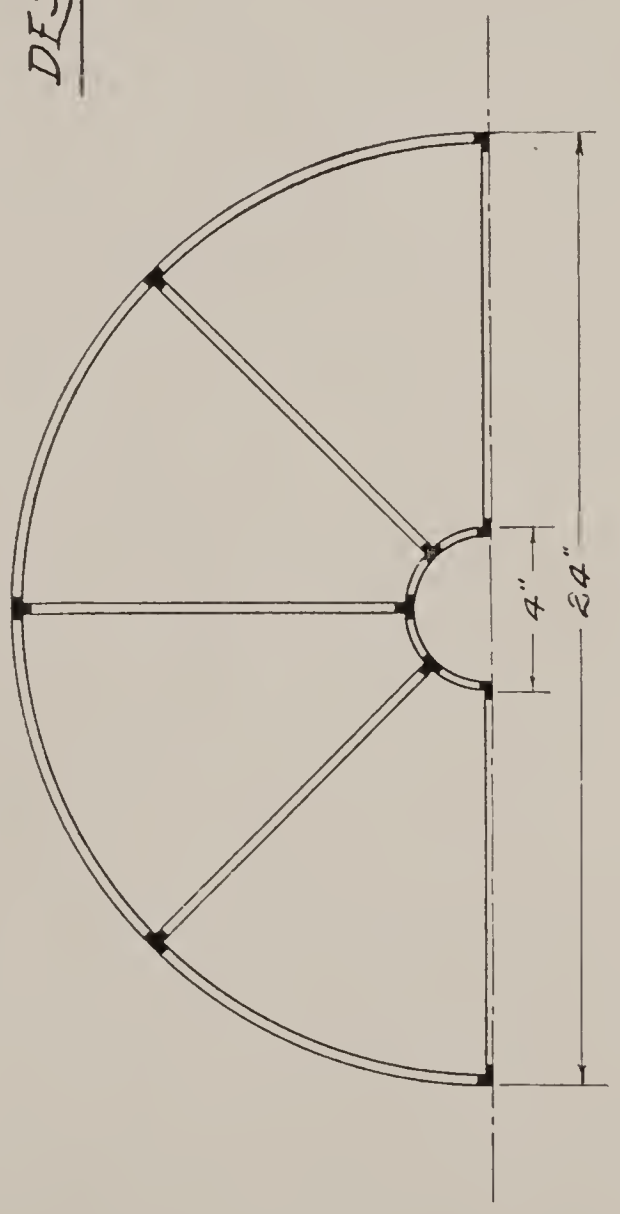
All wire No. 12.

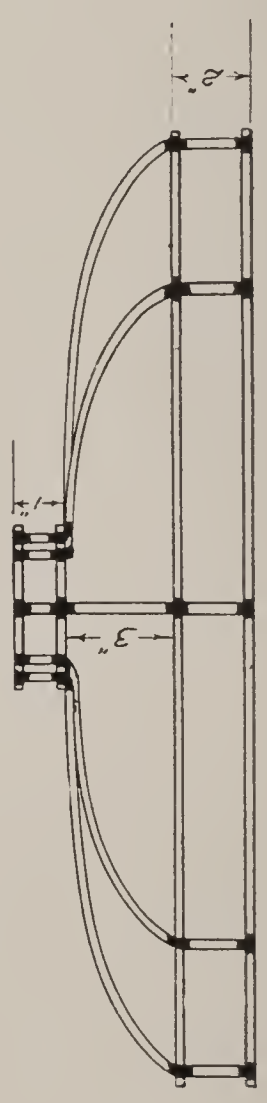
If this design is desired for a table lamp the diameter should be 14 or 16 inches.

DESIGN NO. 8.



a-a = 3"
b-b = 2 7/8"
c-c = 2 13/16"
d-d = 2 3/4"
e-e = 2 11/16"
f-f = 2 5/8"
g-g = 2 9/16"
h-h = 2 3/8"
i-i = 2 1/16"
j-j = 1 1/2





DESIGN No. 8

In all preceding designs only the simple arched or straight wires have been used. In this design we have curved main-ribs, which are somewhat more difficult to shape. Observe the lay-out of the main rib as shown in the small drawing. To get the proper curve, the form should be laid out in full size, being careful to get the dimensions exactly as shown.

Make all main rings and shape all ribs to the proper form before beginning to solder. If short pieces of wire are soldered to the two pairs of main rings to hold them the proper distance apart, the ribs may be more easily soldered in place. Use the plain soldered joint.

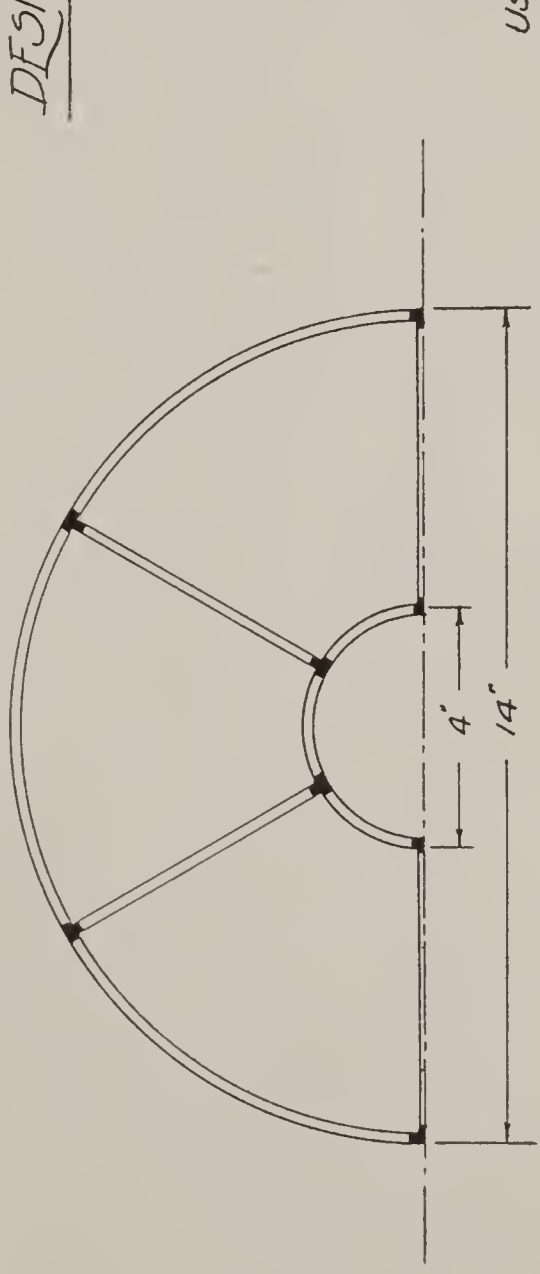
Make the support for this frame as shown in design No. 4.

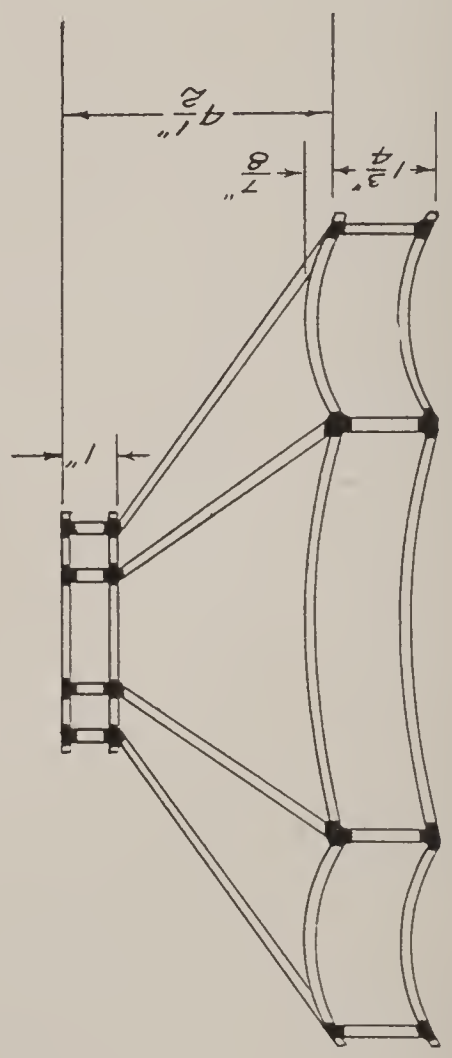
All wire No. 12.

Shade suitable for reading lamp.

DESIGN NO - 9.

Use hanger shown in design 5.





DESIGN No. 9

This is a small circular frame having arched wires at the bottom.

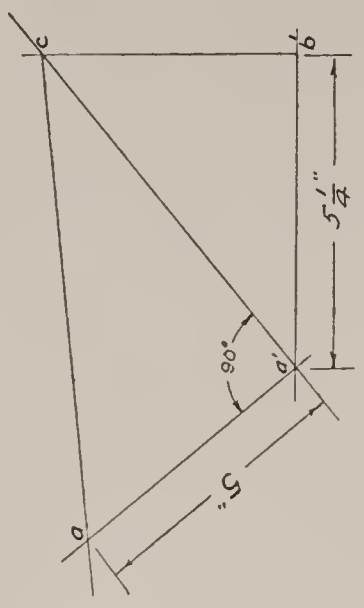
The top portion of the frame is made as described in design No. 3. To make the arched bottom wires, lay out two rings 16″ in diameter. Using the round nose-pliers, bend these wires up at the proper places as shown in the drawing. If properly shaped, these rings should be about 14″ in diameter after bending.

By referring to preceding designs, the student may select a support for this shade suited to his particular needs.

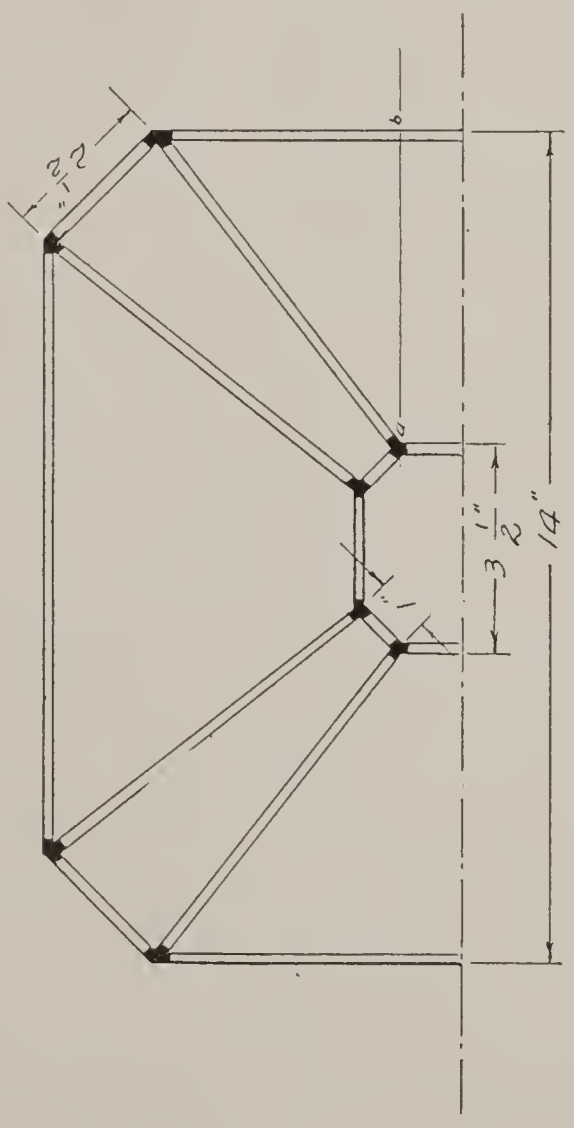
All wires No. 12.

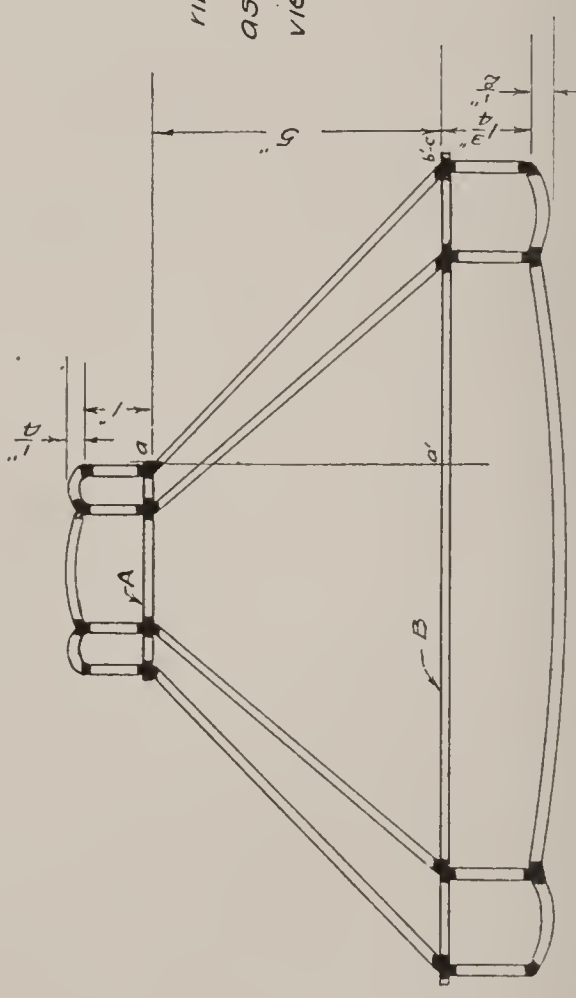
Shade suitable for table lamp.

DESIGN NO-10.



To find the true length of the main ribs lay out the above diagram full size as shown. Get c-b' from a full size top view. a-c is the true length.





DESIGN No. 10

This is a very attractive shade when properly covered, and if the drawings are carefully observed, it should present no great difficulty in construction.

All shapes and dimensions are made plain in the drawing. The shade may be hung by means of a plain ring resting directly on the top of the bulb.

The arched wires at the top and bottom are fastened and shaped as in design No. 7.

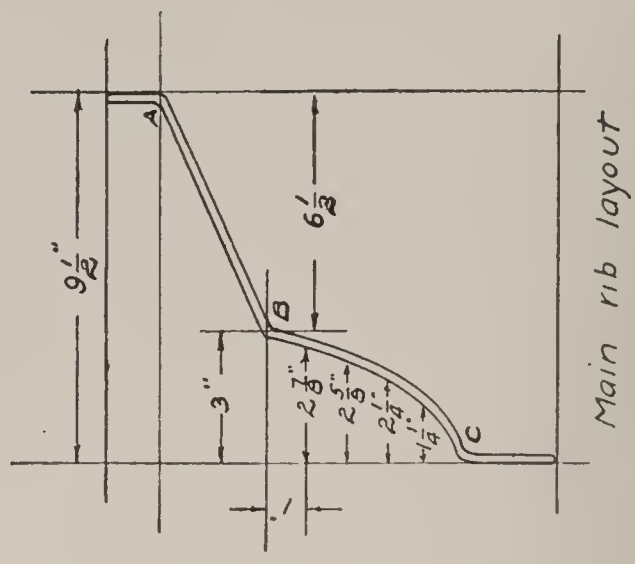
Main frame rings A and B, No. 12 wire.

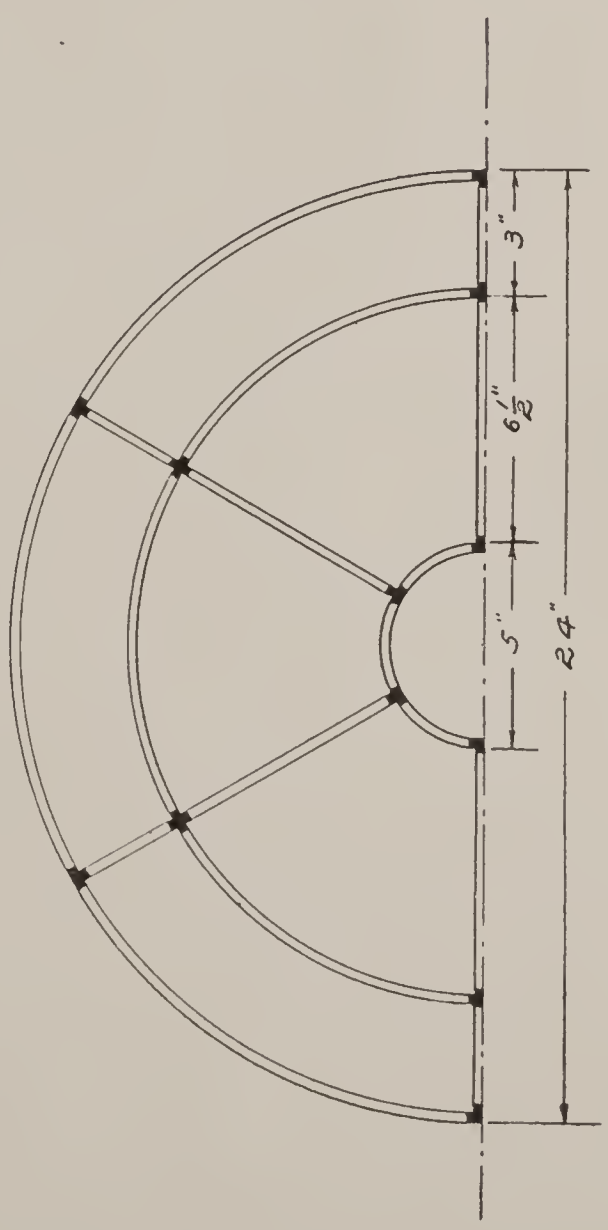
Ribs, top and bottom wire arches, No. 16 wire.

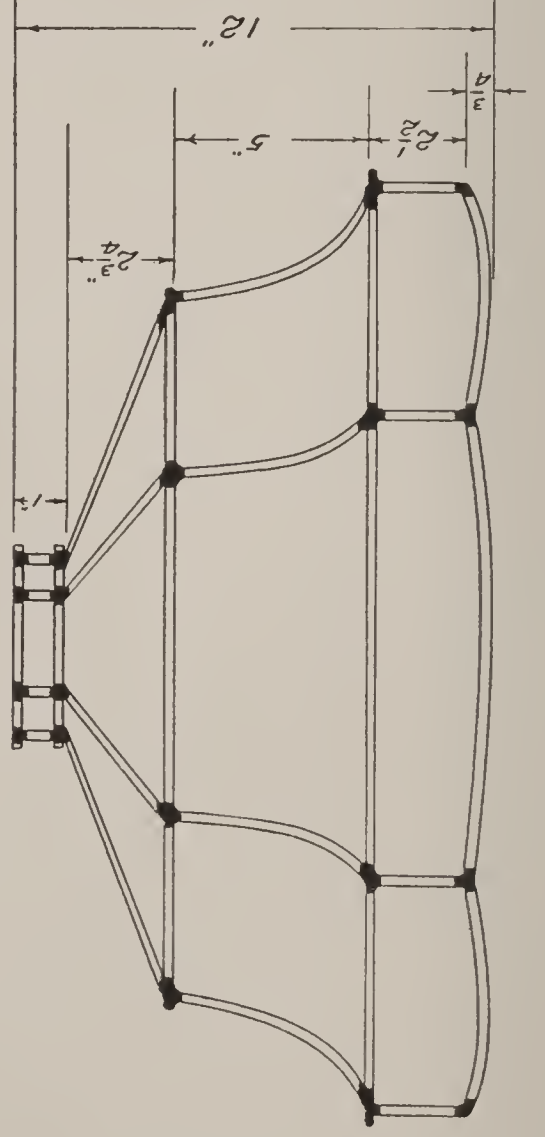
Shade suitable for table lamp.

DESIGN NO 11.

Use a metal support as in design 4.







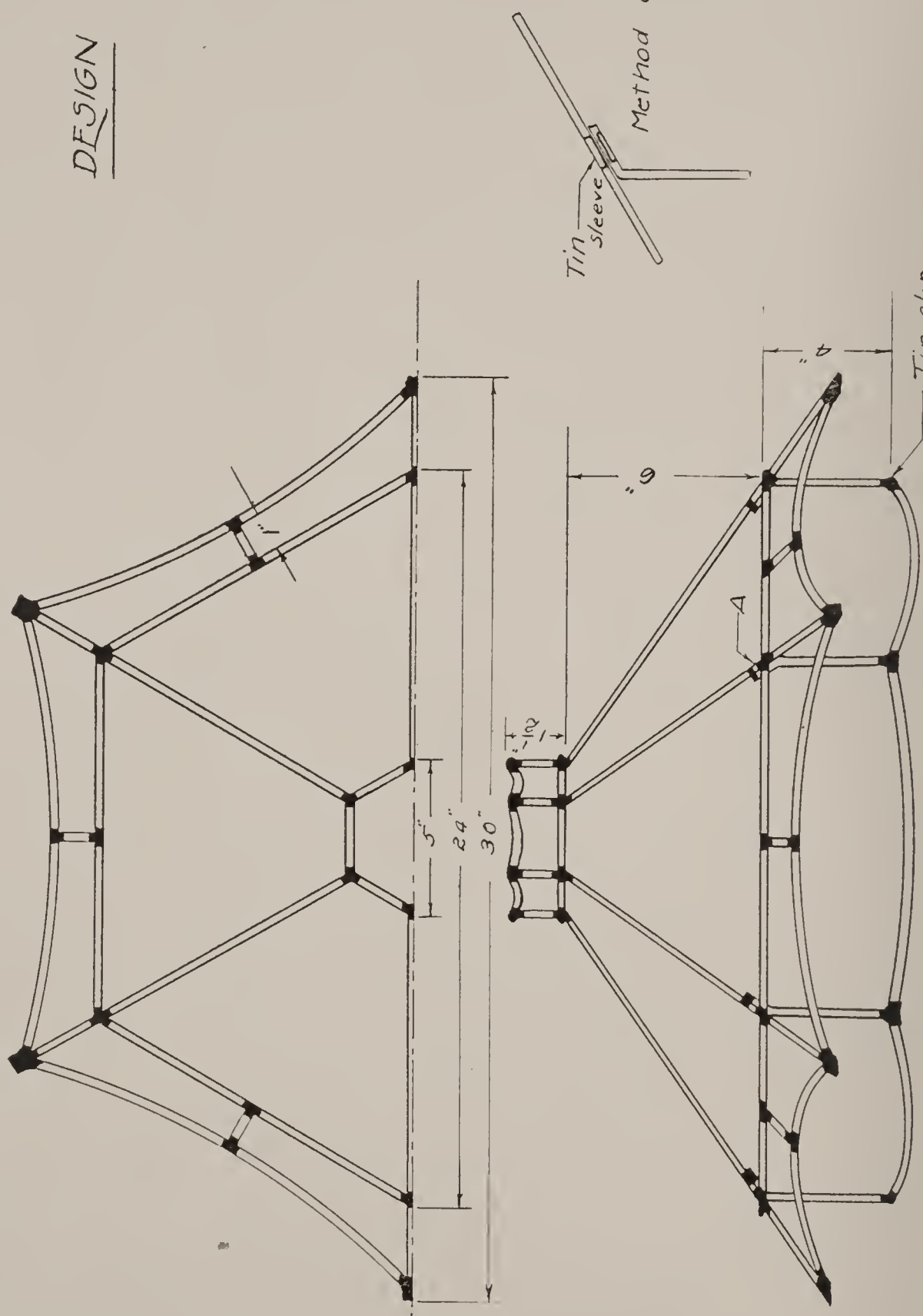
DESIGN No. 11

Success in making this design will depend upon accuracy in shaping the main ribs. All ribs should be carefully shaped and should be exactly alike. The small drawing shows a method of laying out the form over which all ribs are to be shaped. A large board or table top should be used in laying out these forms. Nails driven at the angles A, B, C will insure greater accuracy.

All wires No. 12.

Shade suitable for parlor lamp.

DESIGN NO-12



DESIGN No. 12

This design is very commonly seen in the furniture stores and is used on either floor or table lamps according to size.

In making this frame nearly all the principal methods of fastening are used and have been fully described in the preceding pages. If this frame is built up by using the tin clips and sleeves as shown, it will be very rigid and will stand much hard usage.

The shade must be hung by a metal support.

All wires No. 12.

If desired for table lamp, its diameter should be about 20″.

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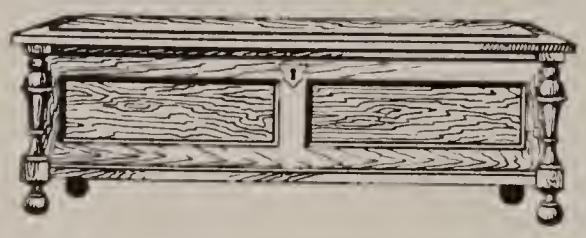

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